

Art Unit: 2600

CLMPTO

AYC

030104

PLEASE CANCEL CLAIM 1 . AND ADD CLAIMS 25-56.

2. A VSB reception system of claim 1, wherein the sequence generator includes:  
a multiplexer for receiving and multiplexing a supplemental data dummy packet and an MPEG data dummy packet and outputting as a multiplexer output signal;  
a randomizer for randomizing the multiplexer output signal;  
a parity inserter for inserting dummy bytes to randomized data;  
a data interleaver for interleaving an output of the parity inserter; and  
a trellis coder for converting interleaved data to symbols and outputting the converted symbols without subjecting to trellis coding.

3. A VSB reception system of claim 2, wherein the trellis coder includes a plurality of coders and precoders for receiving the symbols and forwarding the symbols without subjecting to precoding and coding.

4. A VSB reception system of claim 3, wherein the symbols from the trellis coder includes two bits D1 and D0, wherein if the bit D1 is at a first logic level, a symbol corresponds to a supplemental data symbol, and if the bit D1 is at a second logic level, the symbol is an MPEG data symbol, and when the bit D1 is at the first logic level, the bit D0 is the predefined sequence being used to decode the supplemental data segment.

5. A VSB reception system of claim 2, wherein the randomizer subjects the output signal of the multiplexer using pseudo random bytes and 0x55 to a bit-wise AND logical operation, and a result of the AND logical operation and input bits from the multiplexer to a bit-wise exclusive OR logical operation.

6. A VSB reception system of claim 2, wherein the dummy bytes correspond to the 20 parity bytes are dummy bytes of 0x00, and the MPEG data dummy packet produces 187 dummy bytes of 0x00, and the supplemental data dummy packet produces three dummy bytes of 0x00 corresponding to the MPEG header bytes, and 184 dummy bytes of 0xAA corresponding to the supplemental data packet.

7. A VSB reception system of claim 1, wherein the modified legacy VSB receiver includes:

- a demodulator for receiving the input signal through and converting the input signal into a base band signal, and recovering a segment synchronizing signal, a field synchronizing signal, and a symbol timing from the base band signal;

- a comb filter for removing an NTSC interference signal from an output signal of the demodulator, if the NTSC interference signal is detected;

- a slicer predictor for providing a slicer prediction signal and a prediction reliability signal by using a predefined sequence from the sequence generator;

- a channel equalizer for correcting a distorted channel in an output signal of the comb filter by using the slicer prediction signal, the prediction reliability signal and the predefined sequence and outputting a channel equalizer output signal;

- a phase tracker for correcting a phase of an output signal of the channel equalizer by using the predetermined sequence and the slicer prediction signal;
- a trellis decoder for decoding an output of the phase tracker using Viterbi algorithm and the predefined sequence received from the sequence generator;
- a data deinterleaver for deinterleaving a trellis decoder output signal;
- a Reed-Solomon decoder for decoding a Reed-Solomon coded signal outputted from the data deinterleaver; and
- a data derandomizer for derandomizing a Reed-Solomon decoder output signal.

8. A VSB reception system of claim 7, wherein the Reed-Solomon decoder of the modified legacy VSB receiver removes 20 parity bytes without subjecting the supplemental data segment to Reed-Solomon decoding.

9. A VSB reception system of claim 7, wherein the demultiplexer demultiplexes the derandomized data signal from the modified legacy VSB receiver into the MPEG data segment and the encoded supplemental data segment by using the a multiplexing information signal detected from the field synchronizing signal.

10. A VSB reception system of claim 1, wherein the supplemental data processor includes:

- an MPEG header remover for removing three MPEG header bytes from the supplemental data segment received from the demultiplexer;

- a null sequence remover for removing the null sequence inserted to the supplemental data packet; and

- a Reed-Solomon decoder for subjecting a null sequence remover output to Reed-Solomon decoding.

11. A VSB reception system of claim 10, further comprising a deinterleaver between the null sequence remover and the Reed-Solomon decoder for deinterleaving the null sequence remover output.

12. A VSB reception system of claim 7, wherein the channel equalizer includes:  
a plurality of slicers each having a predetermined signal level detector;  
a feed-forward filter for receiving a comb filter output signal;  
a feedback filter for receiving an output signal of one of the plurality of slicers;  
an adder for adding output signals of the feed-forward filter and the feedback filter and outputting an added signal as a channel equalizer output signal, wherein the plurality of slicers commonly receive the added signal;  
a multiplexer for outputting one of the outputs of the plurality of slicers to the feedback filter in response to a control signal; and  
a controller for updating filter coefficients of the feed-forward filter and the feedback filter and providing the control signal to the multiplexer in response to a multiplexer output signal, the slicer prediction signal, and the prediction reliability signal, the channel equalizer output signal and the predefined sequence to select the multiplexer to output signal from one of the plurality of slicers that has the predetermined signal level detector closes to the comb filter output signal.

13. A VSB reception system of claim 12, wherein the slicer predictor receives the channel equalizer output signal, the predefined sequence generated from the sequence generator and information that the symbol received is of the supplemental data packet, estimates a register value of the trellis coder, calculates prediction reliability, and forwards the estimated register value to the controller of the channel equalizer.

14. A VSB reception system of claim 13, wherein the plurality of slicers includes first to third slicers for processing MPEG data symbols, and fourth to ninth slicers for processing the supplemental data symbols, wherein the first slicer has 8 level values of -7, -5, -3, -1, +1, +3, +5,

+7, the second slicer has 4 level values of -7, -3, +1, +5, the third slicer has 4 level values of -5, -1, +3, +7, the fourth slicer has 4 level values of -7, -5, +1, +3, the fifth slicer has 4 level values of -3, -1, +5, +7, the sixth slicer has 2 level values of -7, +1, the seventh slicer has 2 level values of -5, +3, the eighth slicer has 2 level values of -3, +5, and the ninth slicer has 2 level values of -1, +7.

15. A VSB reception system of claim 14, wherein -7 denotes 000, -5 denotes 001, -3 denotes 010, -1 denotes 011, +1 denotes 100, +3 denotes 101, +5 denotes 110, and +7 denotes 111.

16. A VSB reception system of claim 14, wherein, with respect to the MPEG data symbols, the first slicer is selected in a low reliability case, the second slicer is selected for a high reliability case and the estimated register value is at a first logic level, and the third slicer is selected for a high reliability case and the estimated register value is at a second logic level.

17. A VSB reception system of claim 14, wherein, with respect to the supplemental data symbols;

one of the fourth slicer and the fifth slicer is selected in response to the predefined sequence for a low reliability case;

the sixth slicer is selected for a high reliability case and the predefined sequence value and the estimated register value are at a first logic level;

the seventh slicer is selected for a high reliability case and the predefined sequence value is at a first logic level and the estimated register value is at a second logic level;

the eighth slicer is selected for a high reliability case and the predefined sequence value is at a second logic level and the estimated register value is at a first logic level; and

the ninth slicer is selected for a high reliability case and the predefined sequence value and the estimated register value are at a second logic level.

18. A VSB-reception system of claim 1, wherein the sequence generator is responsive in synchronous to the field synchronizing signal.

19. A VSB reception system for receiving and decoding an input signal comprising an MPEG data segment and a supplemental data segment transmitted from a VSB transmission system, the VSB reception system comprising:

- a modified legacy VSB receiver for processing the input signal received from the VSB transmission system in a reverse order of the VSB transmission system and outputting a derandomized data signal;

- a demultiplexer for demultiplexing the derandomized data signal from the modified legacy VSB receiver into the MPEG data segment and an encoded supplemental data segment; and

- a supplemental data processor for decoding the encoded supplemental data segment from the demultiplexer to obtain the supplemental data segment, wherein the supplemental data processor includes:

- an MPEG header remover for removing three MPEG header bytes from the supplemental data segment received from the demultiplexer;

- a null sequence remover for removing the null sequence inserted to the supplemental data packet; and

- a Reed-Solomon decoder for subjecting a null sequence remover output to Reed-Solomon decoding.

20. A VSB reception system of claim 19, wherein the modified legacy VSB receiver includes:

- a demodulator for receiving the input signal through and converting the input signal into a base band signal, and recovering a segment synchronizing signal, a field synchronizing signal, and a symbol timing from the base band signal;

- a comb filter for removing an NTSC interference signal from an output signal of the demodulator, if the NTSC interference signal is detected;

a slicer predictor for providing a slicer prediction signal and a prediction reliability signal by using a predefined sequence from the sequence generator;

a channel equalizer for correcting a distorted channel in an output signal of the comb filter by using the slicer prediction signal, the prediction reliability signal and the predefined sequence and outputting a channel equalizer output signal;

a phase tracker for correcting a phase of an output signal of the channel equalizer by using the predetermined sequence and the slicer prediction signal;

a trellis decoder for decoding an output of the phase tracker using Viterbi algorithm and the predefined sequence received from the sequence generator;

a data deinterleaver for deinterleaving a trellis decoder output signal;

a Reed-Solomon decoder for decoding a Reed-Solomon coded signal outputted from the data deinterleaver; and

a data derandomizer for derandomizing a Reed-Solomon decoder output signal.

21. A VSB reception system of claim 20, wherein the Reed-Solomon decoder of the modified legacy VSB receiver removes 20 parity bytes without subjecting the supplemental data segment to Reed-Solomon decoding.

22. A VSB reception system of claim 19, wherein the demultiplexer demultiplexes the derandomized data signal from the modified legacy VSB receiver into the MPEG data segment and the encoded supplemental data segment by using the a multiplexing information signal detected from the field synchronizing signal.

23. A VSB reception system of claim 21, wherein the demultiplexer demultiplexes the derandomized data signal from the modified legacy VSB receiver into the MPEG data segment and the encoded supplemental data segment by using the a multiplexing information signal detected from the field synchronizing signal.

24. A VSB reception system of claim 19, further comprising a deinterleaver between the null sequence remover and the Reed-Solomon decoder for deinterleaving the null sequence remover output.

25. (New) An enhanced VSB receiver for receiving and decoding a terrestrial broadcasting signal transmitted from a VSB transmitter, the enhanced VSB receiver comprising:

a VSB demodulator for receiving an input signal including main data and enhanced data from the VSB transmitter and converting the input signal into a base band signal;

a symbol indicator for indicating whether each symbol included in the input signal corresponds to the main or enhanced data, and generating a sequence of null bits identical to a sequence of null bits previously inserted into the enhanced data at predefined locations by the VSB transmitter; and

a trellis decoder for decoding the base band signal outputted from the demodulator by using a Viterbi decoding algorithm and the sequence of null bits generated from the symbol indicator.

26. (New) The enhanced VSB receiver of claim 25, further comprising:

a slicer predictor for providing at least one of a slicer prediction signal and a prediction reliability signal by using the sequence of null bits; and

a channel equalizer which corrects a distorted channel in the base band signal by using the slicer prediction signal, the prediction reliability signal, and the sequence of null bits generated from the symbol indicator.

27. (New) The enhanced VSB receiver of claim 26, further comprising a phase tracker for correcting a phase of the channel-corrected signal outputted from the channel equalizer by using the sequence of null bits outputted from the symbol indicator and the slicer prediction signal.

28. (New) The enhanced VSB receiver of claim 25, further comprising:

a data deinterleaver for deinterleaving the Viterbi-decoded signal outputted from the trellis decoder;

a Reed-Solomon decoder for decoding the deinterleaved signal outputted from the data deinterleaver; and

a data derandomizer for derandomizing the Reed-Solomon-decoded signal outputted from the Reed-Solomon decoder.



29. (New) The enhanced VSB receiver of claim 28, wherein the Reed-Solomon decoder removes 20 parity bytes from the deinterleaved signal outputted from the data deinterleaver without subjecting the enhanced data to Reed-Solomon decoding.

30. (New) The enhanced VSB receiver of claim 25, further comprising a comb filter for removing an NTSC interference signal from the base band signal converted by the demodulator if the NTSC interference signal is detected.

31. (New) The enhanced VSB receiver of claim 25, further comprising a demultiplexer for demultiplexing the Viterbi-decoded signal outputted from the trellis decoder into the main data and the enhanced data.

32. (New) The enhanced VSB receiver of claim 25, wherein the demodulator recovers a segment synchronizing signal, a field synchronizing signal, and a symbol timing from the base band signal.

33. (New) The enhanced VSB receiver of claim 32, further comprising a demultiplexer for demultiplexing the Viterbi-decoded signal into the main data and the enhanced data according to multiplexing information detected from the field synchronizing signal recovered by the demodulator.

34. (New) The enhanced VSB receiver of claim 25, further comprising:  
a demultiplexer for demultiplexing the Viterbi-decoded signal into the main data and the enhanced data; and  
a supplemental VSB processor for decoding the enhanced data demultiplexed from the demultiplexer to obtain original data.

35. (New) The enhanced VSB receiver of claim 34, wherein supplemental VSB processor comprises:  
a header remover for removing header bytes from the enhanced data received from the demultiplexer;  
a null sequence remover for removing the sequence of null bits from the header-removed data;  
and  
a Reed-Solomon decoder for subjecting the null-sequence-removed data to Reed-Solomon decoding.

36. (New) The enhanced VSB receiver of claim 26, wherein the channel equalizer comprises:

- a plurality of slicers, each slicer having a predetermined signal level detector;
- a feed-forward filter for receiving the base band signal from the demodulator;
- a feedback filter for receiving an output signal of one of the plurality of slicers;

an adder for adding output signals of the feed-forward filter and the feedback filter and outputting an added signal as a channel equalizer output signal, wherein the plurality of slicers commonly receive the added signal;

a multiplexer for outputting one of the outputs of the plurality of slicers to the feedback filter in response to a control signal; and

a controller for updating filter coefficients of the feed-forward filter and the feedback filter and providing the control signal to the multiplexer in response to a multiplexer output signal, the slicer prediction signal, and the prediction reliability signal, the channel equalizer output signal, and the sequence of null bits to select the multiplexer to output signal from one of the plurality of slicers that has the predetermined signal level detector closes to the based band signal.

37. (New) The enhanced VSB receiver of claim 36, wherein the slicer predictor receives the channel-corrected signal, the sequence of null bits generated from the symbol indicator and the information that the symbol received is of the enhanced data, estimates a register value of the trellis coder, calculates prediction reliability, and forwards the estimated register value to the controller of the channel equalizer.

38. (New) The enhanced VSB receiver of claim 37, wherein the plurality of slicers includes first to third slicers for processing main data symbols, and forth to nine slicers for processing the enhanced data symbols, wherein the first slicer has 8 level values of -7, -5, -3, -1, +1, +3, +5, +7, the second slicer has 4 level values of -7, -3, +1, +5, the third slicer has 4 level values of -5, -1, +3, +7, the fourth slicer has 4 level values of -7, -5, +1, +3, the fifth slicer has 4 level values of -3, -1, +5, +7, the sixth slicer has 2 level values of -7, +1, the seventh slicer has 2 level values of -5, +3, the eighth slicer has 2 level values of -3, +5, and the ninth slicer has 2 level values of -1, +7.

Art Unit: 2600

39. (New) The enhanced VSB receiver of claim 38, wherein with respect to the main data symbols, the first slicer is selected in a low reliability case, the second slicer is selected for a high reliability case the estimated register value is at a first logic level, and the third slicer is selected for a high reliability case and the estimated register value is at a second logic level.

40. (New) The enhanced VSB receiver of claim 38, wherein with respect to the enhanced data symbols:

one of the fourth slicer and the fifth slicer is selected in response to the null bit value for a low reliability case;

the sixth slicer is selected for a high reliability case and the null bit value and the estimated register value are at a first logic level;

the seventh slicer is selected for a high reliability case and the null bit value is at a first logic level and the estimated register value is at a second logic level;

the eighth slicer is selected for a high reliability case and the null bit value is a second logic level and the estimated register value is at a first logic level; and

the ninth slicer is selected for a high reliability case and the null bit value and the estimated register value are at a second logic level.

41. (New) The enhanced VSB receiver of claim 25, wherein the main data included in the input signal comprises MPEG data.

42. (New) The enhanced VSB receiver of claim 25, wherein the symbol indicator comprises:  
a multiplexer for receiving and multiplexing an enhanced data dummy packet and a main data dummy packet and outputting as a multiplexer output signal;  
a randomizer for randomizing the multiplexer output signal;  
a parity inserter for inserting dummy bytes to the randomized data;  
a data interleaver for interleaving an output of the parity inserter; and  
a trellis coder for converting the interleaved data to symbols and outputting the converted symbols without subjecting to trellis coding.

43. (New) The enhanced VSB receiver of claim 42, wherein each symbol outputted from the trellis coder includes a bit D1, wherein if the bit D1 is at a first logic level, a corresponding symbol included in the input signal corresponds to an enhanced data symbol, and if the bit D1 is at a second logic level, the symbol corresponds to a main data symbol.

44. (New) The enhanced VSB receiver of claim 42, wherein each symbol outputted from the trellis coder includes two bits D1 and D0, wherein if the bit D1 is at a first logic level, the bit D0 represents a corresponding one of the sequence of null bits included in the enhanced data.

Art Unit: 2600

45. (New) A method of receiving and decoding a terrestrial broadcasting signal for a VSB receiver, the method comprising:

receiving an input signal including main data and enhanced data from a VSB transmitter and converting the received input signal into a base band signal;

indicating whether each symbol included in the input signal corresponds to the main data or enhanced data;

generating a sequence of null bits identical to a sequence of null bits previously inserted into the enhanced data at predefined locations by the VSB transmitter; and

decoding the base band signal using a Viterbi decoding algorithm and the sequence of null bits.

46. (New) The method of claim 45, further comprising:

providing at least one of a slicer prediction signal and a prediction reliability signal by using the generated sequence of null bits; and

correcting a distorted channel in the base band signal by using the slicer prediction signal, the prediction reliability signal, and the generated sequence of null bits.

47. (New) The method of claim 46, further comprising correcting a phase of the channel-corrected signal by using the sequence of null bits and the slicer prediction signal.

48. (New) The method of claim 45, further comprising:

deinterleaving the Viterbi-decoded signal;

Reed-Solomon decoding the deinterleaved signal; and

derandomizing the Reed-Solomon-decoded signal.

49. (New) The method of claim 45, further comprising removing an NTSC interference signal from the base band signal if the NTSC interference signal is detected.

50. (New) The method of claim 45, further comprising:

demultiplexing the Viterbi-decoded signal into the main data and the enhanced data; and

decoding the demultiplexed enhanced data to obtain original data.

51. (New) The method of claim 50, wherein the converting the received input signal into a base band comprises recovering at least one of a segment synchronizing signal, a field synchronizing signal, and a symbol timing from the base band signal.

52. (New) The method of claim 51, wherein the demultiplexing the Viterbi-decoded signal into the main data and the enhanced data comprises:  
detecting multiplexing information included in the recovered field synchronizing signal; and  
demultiplexing the Viterbi-decoded signal into the main data and the enhanced data according to the detected multiplexing information.

53. (New) The method of claim 50, wherein the decoding the demultiplexed enhanced data to obtain original data comprises:  
removing header bytes from the demultiplexed enhanced data;  
removing the sequence of null bits from the header-removed data; and  
Reed-Solomon decoding the null-sequence-removed data to obtain the original data.

54. (New) The method of claim 45, wherein the indicating whether each symbol included in the input signal corresponds to the main data or enhanced data comprises:  
receiving and multiplexing an enhanced dummy packet and a main data dummy packet and outputting as a multiplexer output signal;  
randomizing the multiplexer output signal;  
inserting dummy bytes to the randomized signal;  
interleaving the dummy-byte-inserted signal; and  
converting the interleaved signal into symbols and outputting the symbols without subjecting the trellis coding.

55. (New) The method of claim 54, wherein each converted symbol includes a bit D1, wherein if the bit D1 is at a first logic level, a corresponding symbol included in the input signal corresponds to an enhanced data symbol, and if the bit D1 is at a second logic level, the symbol corresponds to a main data symbol.

56. (New) The method of claim 54, wherein each converted symbol includes two bits D1 and D0, wherein if the bit D1 is at a first logic level, the bit D0 represents a corresponding one of the sequence of null bits included in the enhanced data.